

**Predicting a debt crisis in Selected Caribbean Countries: An
Application of the Manasse-Roubini 'Rules of Thumb'**

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Abstract

Within recent years, the incidence of debt default and debt restructuring has increased significantly, notably in countries such as Russia, Pakistan, Argentina and Ecuador. Even more recently, countries of the Caribbean have been affected and three Caribbean countries have embarked on debt restructuring programs: the Dominican Republic in May 2005, Grenada in September 2005 and Belize in January 2007. Thus, the issues of debt, debt-carrying capacity, debt crisis and debt restructuring have become of critical concern in the Caribbean region. A debt crisis can have severe consequences for an economy; if only because there are many negative consequences of a debtor country's inability or reluctance in repaying its creditors. This paper evaluates the usefulness of the Manasse-Roubini 'Rules of Thumb' in predicting a debt crisis in selected Caribbean countries and makes recommendations for an alternative methodology for predicting debt crisis in the Caribbean.

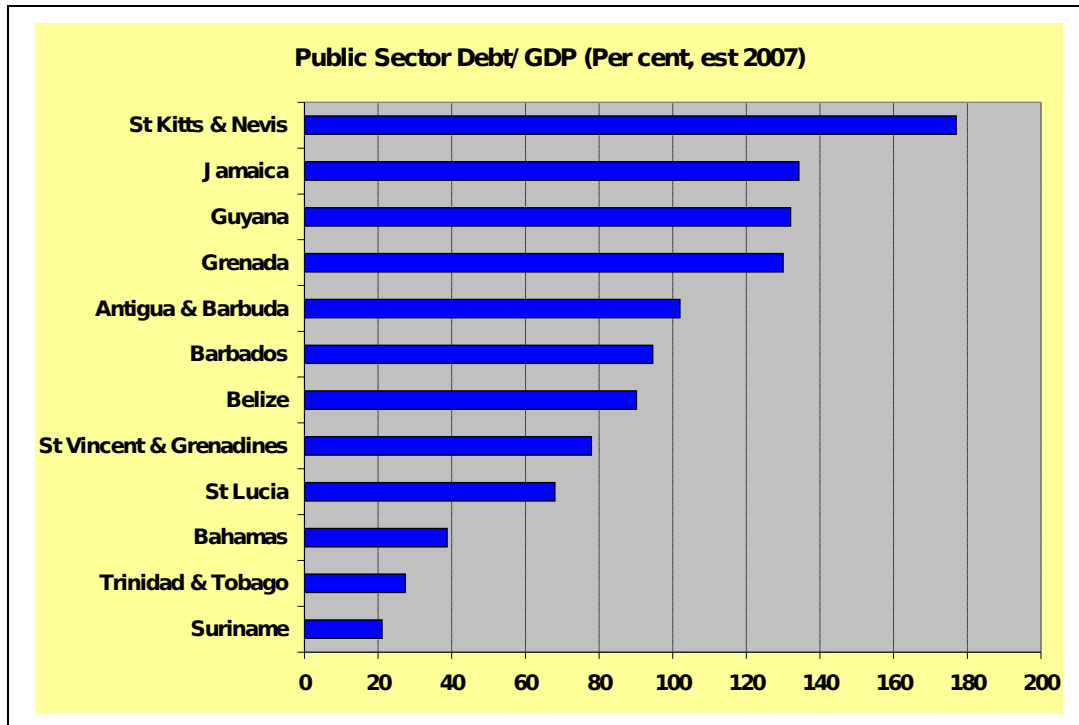
Introduction

Within recent years, the incidence of debt default and debt restructuring has increased significantly, notably in countries such as Russia, Pakistan, Argentina and Ecuador. Even more recently, countries of the Caribbean have been affected and, in the past 4 years, three Caribbean countries have embarked on debt restructuring programs – the Dominican Republic (DR) in May 2005, Grenada in September 2005 and Belize in January 2007. Thus, the issue of debt and debt-carrying capacity has become a critical concern in the region.

The Caribbean, historically, has been plagued by excessively high debt burdens. Most of the small islands of the region are currently ranked in the top 15 most indebted emerging markets in the world and many Caribbean economies are struggling with the adverse impact of multiple shocks, for which they are not fully prepared. Some shocks are external and permanent – falling aid flows, erosion of preferential trade agreements for sugar and bananas, and interventions related to drug-trafficking and money laundering. The Caribbean at the time of writing (2008) is dealing with high oil prices and rising global interest rates. Other shocks are domestic – intractable unemployment and poverty as well as a rising incidence of HIV/AIDS. Added to this mix is the marked frequency of natural disasters, especially hurricanes and floods, which often derail growth and impose substantial costs. All these phenomena have the potential to impose significant costs to government and place additional pressure on the fiscal accounts, further limiting fiscal flexibility and worsening the region's debt profile.

Figure 1 below shows that the average public sector debt-to-GDP ratio in the Caribbean is at an unsustainable 92%, with Guyana, Jamaica, Antigua and Barbuda and Grenada well in excess of 100%. At the end of 2007, Guyana's public sector debt was estimated at 132% of GDP, more than 3 times that of Trinidad & Tobago, while St Kitts and Nevis has the highest level of debt in the Caribbean at close to 180% of GDP. (IMF 2007)

Figure 1: Public Sector Debt in the Caribbean



Source: International Monetary Fund

The subject of debt crisis and debt restructuring became very topical in the last two decades or so, when occurrences increased in number as well as severity. The area of study is especially important as it can have severe repercussions on the entire economy. The issue of debt crisis is wide ranging, and can encompass several ideas. Debt crisis can have severe implications for the economy. There are many consequences of a debtor country's inability or reluctance in repaying its creditors.

Literature Review

One consequence of a debt crisis can be the need for debt renegotiation, and ultimately debt restructuring. The process has varying and distinct features. The role of multilateral financial institutions also plays a major role in determining the success of a debt restructuring program, and so the role of the International Monetary Fund (IMF) and the World Bank in debt crisis and eventual debt renegotiation and restructuring becomes very important.

Manasse and Roubini (2005) defined specifically, a country to be in debt crisis if it is classified as being in default by international ratings agency, Standard and Poor's, or if it receives a large non-concessional IMF loans (where 'large' means in excess of 100 per cent quota).

Manasse and Roubini (2005) undertook an empirical investigation of the set of economic and political conditions, which are associated with a probable occurrence of a sovereign debt crisis. In the study, Manasse et al sought to provide answers to the following vital questions:

- What set of economic and political conditions is empirically associated with a likely occurrence of a sovereign debt crisis?
- Can one derive thresholds for vulnerability indicators that may signal a higher likelihood of a sovereign debt crisis?

This study distinguishes between three types of debt crises: firstly episodes of insolvency (high debt and inflation) or debt unsustainability due to high debt and illiquidity. Secondly, episodes of illiquidity, where near default is driven by large stocks of short term liabilities relative to foreign exchange reserves and thirdly, episodes of macro and exchange rate weaknesses (large over-valuation and negative growth shocks). Conversely, a relatively "risk-free" country type is described by a handful of economic characteristics: low total external debt relative to ability to pay, low short-term debt over foreign reserves, low public external debt over fiscal

revenue, and an exchange rate that is not excessively overvalued. Political instability and tight monetary conditions in international financial markets aggravate liquidity problems.

The authors' methodology (use of a binary recursive tree) proved very useful in the derivation of 'rules of thumb' or vulnerability thresholds, which can be used as early warning systems to predict a crisis.

Rose (2004) analyzed the effects of sovereign debt renegotiation on international trade, outlining the trade consequences of default. According to Rose (2004), because creditors deter default, or because trade finance evaporates, there are three primary reasons why countries pay their international debts. Klimenko (2001) also analyzed and articulated the effects a debtor country's pattern of trade with commercial creditors' home countries on the outcome of debt rescheduling negotiations. The author took the study one step further and also argued that the country's market power also affects its threat point in bargaining with its creditors and the International Financial Institutions (IFI's) over the terms of the rescheduling.

Cordella (2005) looked at the relationship between debt and economic growth. He looked at how the debt-growth relationship varies with indebtedness levels and other country characteristics in a panel of developing countries. The study looked at how indebtedness has affected growth and investment patterns in Highly Indebted Poor Countries (HIPC's) as well as in countries with different levels of indebtedness or with policies or institutions of varying quality in the past 3 decades or so. Cordella (2005) concluded that at the intermediate levels of debt, there is a negative marginal relationship between debt and growth, but not at very low levels of debt. The findings suggest that there is a negative marginal relationship between debt and growth at intermediate levels of debt, but not at very low

debt levels, below the “debt overhang” threshold, or at very high levels, above the “debt irrelevance” threshold¹.

The role of international financial institutions has become important over the past years. Marchesi (2002) sought to establish an empirical relationship between the adoption of an International Monetary Fund (IMF) program and the concession of a debt rescheduling by commercial creditors. A priori, if countries have arrangements with the IMF, they are more likely to obtain successful rescheduling of their external debt. The results of the study confirmed that the adoption of an IMF program (as well as the conditionality that are outlined) can work as a signal of a country’s good intention and may induce creditors to concede a rescheduling of a country’s external debt. Bulow and Rogoff (1990) put forward the question ‘should taxpayers of the wealthier countries finance a leveraged buyout of third world debt’, and they looked at whether a debt discount facility will yield only minimal benefits. According to the authors, a debt discount facility would allow wealthier countries to buy up the debts at a discount and be able to forgive a large portion of the debt so that the debtor country could afford to repay the remainder. Boot and Kanatas (1995) looked at the importance of the International Monetary Fund and the World Bank as agencies that potentially can facilitate a pre-commitment. The involvement of an international agency in renegotiation of sovereign debt may be useful in terms of promoting credibility. To the extent that a sovereign sees pre-commitment as a valuable contract feature, deviations can be credibly punished by the IMF and World Bank by exclusions of such features from future renegotiations with any lenders.

¹ The authors denote the first threshold, i.e., the indebtedness level above which the marginal effect of debt on growth becomes negative, as the debt overhang threshold. The second threshold is defined, i.e., the indebtedness level above which the marginal effect of debt on growth becomes zero, as the debt irrelevance threshold.

Tillman (2005) on the other hand looked at the role of private sector involvement in the resolution of debt crises. Rather than being 'bailed out' by international agencies such as the IMF and the World Bank, banks and international investors should be bailed-in in order to realize some burden sharing. Advocates of private sector involvement (PSI) argue that the prospect of burden sharing between the public and the private sector in case of default discourages excessive risk taking of investors and limits the scope for moral hazard in anticipation of emergency assistance from the IMF.

Stylized Facts

This portion of the paper will examine the fiscal stance and the debt profile of six selected Caribbean countries: Barbados, Belize, the Dominican Republic, Grenada, Jamaica and Trinidad & Tobago. Among other factors, a country's debt profile is crucial in determining whether or not it can repay its interest and principal obligations.

Barbados has long suffered high debt levels, consistently above the Latin America and Caribbean averages. About 75% of the country's total public debt is domestic and denominated in domestic currency, and this makes Barbados much less vulnerable to a possible debt crisis than countries with similar levels of debt but a larger share of external debt and debt denominated in foreign currency. The fiscal deficit is estimated to come in around 1.7% of GDP in 2005/2006, below the fiscal deficit of 2.6% of GDP in the previous year. By further controlling off-budget spending, the government can bring the overall fiscal deficit to near balance share the burden in tempering the strong expansion of domestic demand. Barbados' fiscal flexibility is one of the most constraining factors to the country's credit rating. At 80% of GDP, the general government debt is at an unsustainably high level and could become increasingly incompatible with the fixed exchange rate system. The country is currently rated by Standard and Poor's as BBB+ (investment grade), which reflects the improvements that the government has made the recent past, following the completion of the Cricket competition. Barbados' external accounts are highly susceptible to adverse external shocks, which have the potential to reduce the country's foreign exchange earning capacity and place undue pressure on the external liquidity. International reserves are likely to increase to about US\$750 million by the end of 2007 largely reflective of improvements in the current account balance and continued large foreign direct and equity inflows.

Belize's external debt increased steadily in the first half of the 1980s moving from 25 % of GDP in 1980 to 50 % in 1985. It subsequently fell over the

1985–1993 period to 30 % of GDP. Until the late 1990's, most of Belize's external debt was held by official creditors and a large share of it was bilateral debt. Belize's debt-to-GDP ratio went from around 60% in 2000 to more than 95% in 2004. Due to fiscal mismanagement and poor economic policies, the country's fiscal balances deteriorated rapidly, as the government racked up huge deficits on the fiscal accounts, and financing requirements started to soar, all in the context of a falling stock of foreign reserves. This forced the government to restructure its stock of debt in late 2006. The government's officially announced in August 2006 its intention to seek debt relief on its approximately US one billion outstanding external debt. The credit rating on Belize was upgraded to 'B' from 'SD' following the successful debt restructuring exercise by the government. Back in 2000, major infrastructure and capital projects in Belize, as well as private-sector capital import, resulted in a sharp rise in the country's current account deficit as it pushed the trade deficit wider with the increase in the imports, particularly capital imports. The external accounts started a promising recovery since 2006, with the current account deficit improving significantly, being supported by developments in the real economy. Large gains from the nascent oil production and growing tourism receipts helped to strengthen current account receipts to 72% of GDP in 2006 from 62% in 2005. External liquidity pressures have also subsided somewhat owing to the improvements in the current account and the amortization profile. The external financing gap decreased to about 123% of usable reserves.

The Dominican Republic's stock of external debt mushroomed during the 1980's, increasing from 15% of GDP in 1980 to 70% of GDP by 1985. See Figure 4 below. This was largely as a result of large swings in the value of the Dominican peso. The trend was reversed in the 1990's, when the country's external debt started to decline, and by 2000, it reached a minimum of 18% of GDP. During the period 1982 -1994, the Dominican Republic was in default. A Brady Swap implemented in 1993 helped to reduce foreign bank debt from 13% of GDP to 1% of GDP in 1994. The fiscal accounts and debt profile of the Dominican Republic have improved significantly since the crisis of 2003. The government has implemented

important reform measures, which will improve the general government fiscal balances even further. The authorities have adhered strictly to the conditions set out in the IMF's Stand-By Agreement with the country, which has now expired and was not renewed. Dominican Republic is rated as B+ with a negative outlook based on weakening fundamentals and increase concerns about the role of IMF and the impact on fiscal policies. Coming out of the financial crisis in 2003 and with modest economic expansion in 2004, the balance of payments current account ended the year with a surplus of US\$1.40 billion, equivalent to 8.1% of GDP, as imports rose 21% in the final quarter of the year. Gross international reserves stood at US\$824.8 million at the end of 2004, while net reserves closed at US\$602.2 million. Foreign direct investments have played a major role in the Dominican Republic's external accounts over the last five years. Dominican Republic's external vulnerability has lessened significantly over the past years. There has been a rapid accumulation in foreign exchange reserves which has improved the country's external liquidity position, which has in the past been one of the Dominican Republic's major weaknesses.

On 2 April 2007, Standard and Poor's lowered its credit rating on Grenada to 'CCC+' from 'B-', while maintaining the outlook at stable. The downgrade was prompted by increasingly limited fiscal flexibility and deteriorating payment culture, demonstrated by intermittent arrears on domestic commercial debt. Following the disruption caused by Hurricane Ivan in 2004, the country's fiscal performance was significantly set back, as the government spent heavily on reconstruction efforts. The subsequent debt restructuring of 2005 alleviated the amortization and cost profile of Grenada's debt, and the interest cost was cut by more than half, with the maturity of 45% of the total government debt postponed to 2025. However, the restructuring did not address the size of the debt (at least 121% of GDP). The government is heavily dependent upon the continuous inflow of grants. Donor support stood at 28% of government revenue and 11% of GDP in 2005, but was be lower in 2006; grant receipts fell to \$100 million from a total of \$145 million in the first nine months of 2005. Grenada is currently not rated by any of the international rating agencies. For the past seven

years, Grenada has been running substantial deficits on the current account, frequently in excess of 20% of the country's GDP. The country has had a rough run, with the external accounts being hit by a series of negative events, such as natural disasters and big capital projects associated with Cricket World Cup. The current account deficit has been financed by foreign direct investment inflows, which covered 67% of CAD in 2006, up from 57% in 2005. Grenada's public sector external indebtedness has been consistently improving and is estimated at around 65% of current account receipts in 2008.

Jamaica has historically been plagued by high indebtedness and up to 2008, the country's stock of public sector debt remains in excess of 100% of GDP. Jamaica's public sector debt peaked at 218% of GDP in 1985. It then decreased over 1986–1994, reaching a minimum of 72% of GDP in 1994, and subsequently increased again over the 1994–2004 period, returning to figures over 100% of GDP after 2001. Starting in the mid-1990s, Jamaica's domestic debt increased steadily, and by the late 1990s, it had become larger than the country's external debt (in 2004, domestic debt was 84% of GDP and 59% of total debt). The country's high public sector debt is likely to constrain the economy and put pressure on fiscal accounts. This inherent risk places the country's credit rating at 'B', by Standard and Poor's, non-investment grade status. The Jamaican external account has always been a source of concern for many investors, as it has historically been extremely vulnerable to external factors. The macroeconomic instability during the 1990's contributed to large swings in the country's real exchange rate, which acted as a deterrent to export and foreign investment growth. At the start of 2007, the external conditions also improved on the back of an impressive performance of the tourism sector as well as higher private remittance inflows. The higher surplus on the services account was attributed to growth in stopover and cruise passenger arrivals over the period, relative to the January - August 2005 (17.7% and 15.2% respectively), while the transfers account benefited from an increase of 6.8% in gross private remittance inflows. Remittances stood at US\$1.2 billion in September 2006, accounting for about 19% of GDP. Given the vulnerability

of the Jamaican external accounts, the Jamaican credit worthiness will always be constrained by its external liquidity position.

In 1980, at the height of an oil boom, Trinidad & Tobago was characterized by low levels of debt, but this was reversed after oil prices plummeted in the early 1980's. The country's external debt subsequently increased rapidly, with public debt as a ratio of GDP increasing from 6% in 1980 to almost 60% in 1990, reaching a peak of 67% in 1993 (Trinidad & Tobago was in default between 1988 and 1989). In 1993 when the TT dollar was floated, Trinidad & Tobago's total debt stock started to decrease gradually reaching 25% of GDP in 2004. The rise in the country's debt over the 1984-1993 period was financed by issuing both domestic and external debt. The buoyancy of oil prices on the international markets since 2001 has allowed Trinidad & Tobago to substantially improve its debt profile, with the stock of public sector debt falling to about 40% of GDP in 2006. The buoyancy of international oil and natural gas prices has helped to boost the Trinidad & Tobago fiscal as well as the external accounts and has made the country an attractive credit for investors. Trinidad & Tobago is currently rated by Standard and Poor's as A - investment grade. Since the Atlantic LNG -1 project started in 1999, together with the expansion of other petrochemical projects, Trinidad & Tobago's trade balance has been in surplus. Due to the development of the country's energy base and the implementation of economic reform in the early 1990's coming out of the recessionary period of the late 1980's, the external current accounts have generally been performing well. Inflows of Foreign Direct Investment averaged 7.5% of GDP during 1999-2001, highlighting Trinidad & Tobago's strengths in terms of political stability and rich energy resources. (Standard and Poor's, 2002). Trinidad & Tobago's external debt burden has declined significantly during the past five years or so, with the public sector moving into net creditor position at the end of 2006.

Data and Methodolgy

This section will look at the application of the “Rules of Thumb” for Sovereign Debt Crises, postulated by Manasse and Roubini (2005). The Manasse-Roubini paper provides a comprehensive look at 47 countries with market access from 1970 to 2002. The Caribbean countries which were covered by the authors were few, just the Dominican Republic, Jamaica and Trinidad and Tobago. The purpose of this section of the paper will therefore extend that study to look at these countries for the period extended to 2007, as well as the inclusion of other Caribbean countries, such as Barbados, Belize and Grenada.

The objective is to test the robustness of the model put forth by Manasse and Roubini, in the context of the Caribbean region, which has unique characteristics. Three of the countries that we are looking at have all ended up in a debt crisis since 2002, and this study will try to prove whether or not this could have been predicted by the ‘Rules of Thumb’ model.

As mentioned previously, a country is deemed to be in debt crisis if it is classified as being in default by international ratings agency, Standard and Poor’s, or if it receives a large non-concessional International Monetary Fund (IMF) loan (where ‘large’ means in excess of 100 per cent quota).

Data

The data used for the application of the Manasse et al methodology will be divided into three (3) types – macroeconomic fundamentals, variability indicators and political economy indicators. Data will be sourced from the International Monetary Fund, Business Monitor International, and Standard and Poor’s, from where information on sovereign credit rating will be sourced to determine whether or not the country entered a period of crisis. The data series will comprise for the six (6) countries outlined going back since 1990 to 2007, on an annual basis. When a sovereign is rated ad ‘D’ by Standard and Poor’s, according to S&P, “an obligation rated ‘D’ is in

payment default. The 'D' rating category is used when payments on an obligation are not made on the date due even if the applicable grace period has not expired, unless Standard & Poor's believes that such payments will be made during such grace period. The 'D' rating also will be used upon the filing of a bankruptcy petition or the taking of a similar action if payments on an obligation are jeopardized.”

In our sample of Caribbean countries, three can be considered as being in ‘crisis’ during the period under examination. The macroeconomic fundamental indicators which will be used to measure liquidity and solvency will be gauged by debt indicators, such as public and external debt. Since repayment of debt consists of two elements, namely ability and willingness to pay, this set of data will give an idea of the *ability* of a sovereign to repay debt. The political indicators will to an extent provide a gauge of the *willingness* of the sovereign to honour debt obligations.

Testing the empirical tree

The Binary Recursive Tree methodology (BRT) used by Manasse and Roubini is a process that looks for patterns and relationships in the data and is particularly suited for uncovering hidden nonlinear structures and variable interactions in complex datasets. It is a recursive process that splits parent nodes into exactly two child nodes and which further splits each into another pair of child nodes and so on. This main purpose for using this method for the early warning system is due to failure in the past to correctly assess the likelihood of a sovereign default. The aim of this methodology is to provide answers to the following questions: What set of economic and political conditions is empirically associated with a likely occurrence of a sovereign debt crises? ; Can one derive thresholds for vulnerability indicators that may signal a higher likelihood of a sovereign debt?

This section will look specifically at the existing economic and political conditions at the time before, during and after a debt crisis for the six selected countries. Using information derived from Standard and Poor’s and

the IMF, we will determine if and when the countries did in fact experience periods of crises, as defined previously.

Table 1: History of Default (1998 - 2007)

Country	Years of Crisis
Barbados	NO CRISIS
Belize	2005 - 2006
Dominican Republic	2003 - 2005
Grenada	2004 - 2006
Jamaica	1998 - 1999
Trinidad and Tobago	NO CRISIS

Source: Standard & Poor's, International Monetary Fund

Ten important economic variables and political stability measures are used in the analysis. These are total external debt in percent to GDP, short term debt on a remaining maturity basis to foreign reserves, public external debt to government revenue, real GDP growth, inflation, the U.S. treasury bill rate, exchange rate overvaluation, exchange rate volatility, the ratio of external financial requirements to foreign reserves, and the number of years before a presidential election. These will be applied to the empirical tree as done by Manasse and Roubini during the different years to evaluate the effectiveness of the model.

Types I and types II errors

The error of the first kind – type I errors occur when the model predicts a crisis, and it is true - there actually is a crisis. The error of the second kind – type II errors occur when the model does not predict a crisis and there is in fact one. If the model predicts that there will not be a crisis in a given year and there was one, and the model turns out to be incorrect. It is basically the error of failing to reject a null hypothesis when the alternative hypothesis is the true state of nature. In other words, this is the error of failing to observe a difference when in truth there is one. This type of error can only occur when the statistician fails to reject the null hypothesis.

The table 2 below shows the probability of crisis for each year in the period under examination.

Table 2: Probability of Crisis (Percent)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Barbados	0.0	0.0	4 1.5	4 1.5	4 1.5	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8
Belize	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8	4 0.0	4 0.0
Dominican Republic	0.0	0.0	0.0	4 6.8	6 6.8	6 6.8	6 6.8	4 6.8	4 0.0	4 6.8
Grenada	0.0	0.0	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8	4 6.8
Jamaica	4 6.8	4 6.8	4 0.0	4 0.0	4 0.0	6 6.8	6 6.8	6 6.8	4 0.0	6 6.8
Trinidad and Tobago	2.3	2.3	2.3	0.0	2.3	0.0	4 0.0	0.0	0.0	0.0

Using the empirical tree, a country will be defined as crisis prone if the probability of crisis exceeds that of 40% and not crisis prone for probabilities less than 40%. Using this criterion, the table 3 below shows occasions of crisis prone or not crisis prone:

Table 3

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Barbados	Not Crisis Prone	Not Crisis Prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone
Belize	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Not Crisis Prone	Not Crisis Prone
Dominican Republic	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Not Crisis Prone	Crisis prone
Grenada	Not Crisis Prone	Not Crisis Prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone	Crisis prone
Jamaica	Crisis prone	Crisis prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Crisis prone	Crisis prone	Crisis prone	Not Crisis Prone	Crisis prone

			e	e	e				e	
Trinidad and Tobago	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone	Not Crisis Prone

Using the tables above and the table 1 which outlines the episodes of actually debt crisis, we see that the instance of type II errors were more prevalent than that of the type I errors. The model was 100% accurate in predicting *actual* episodes of debt crises in Jamaica, Grenada, the Dominican Republic and Belize. In these countries cumulatively, there were 11 crisis years at different periods of time, and the model was able to correctly predict all. In 2006, Standard and Poor’s downgraded Belize to ‘selective default’ as the country began its debt restructuring program. In December 2006, Belize went into default and was forced to restructure a large part of their debt. Using appendix 1, we look at the economic and political conditions which existed during this year, and proceed as follows:

“Does total external debt to GDP exceed 50% of GDP?”

Since the answer to this is ‘yes’, as this ratio was at 117.2% at the end of 2005, we move to the right and ask the question:

“Is inflation greater than 10.47%?” Inflation in Belize stood at 6.4% at the end of 2005, so we therefore move to the left and ask:

“Do external financing requirements exceed 1.44?” The answer to this is ‘yes’, and so, according to the empirical tree and the complete study done by Manasse and Roubini, Belize was a crisis prone country at the end of 2005 and had a 46.8% crisis probability, which is above the crisis prone threshold of 40%.

The Dominican Republic experienced a financial crisis which began in 2003, which resulted in debt restructuring in 2005. Using the data compiled from

various sources, including the IMF, S&P, Central Bank of the Dominican Republic, and Business Monitor International, we find that the Dominican Republic was in fact heading for a crisis, as their external liquidity conditions became strained, with a crisis probability of 46.8%.

In the case of Grenada, it was at the end of December 2004 that the authorities decided to restructure its debt as it fell into a crisis brought about by the devastating passage of Hurricane Ivan in September of that year. Already being a highly indebted country, Grenada's foreign debt was in excess of 100% of GDP. It fit into the category 'crisis prone' as defined by Manasse et al, and at the end of 2004, with a crisis probability of 46.8%.

We can therefore see that empirically, the 'Rules of Thumb' can still be applied. It accurately predicted the crises experienced by Belize, the Dominican Republic and Grenada. The probability of crisis appeared lowest for Grenada, and justifiably so, as this particular crisis was brought on by externally driven forces which cannot be predicted accurately – natural disaster.

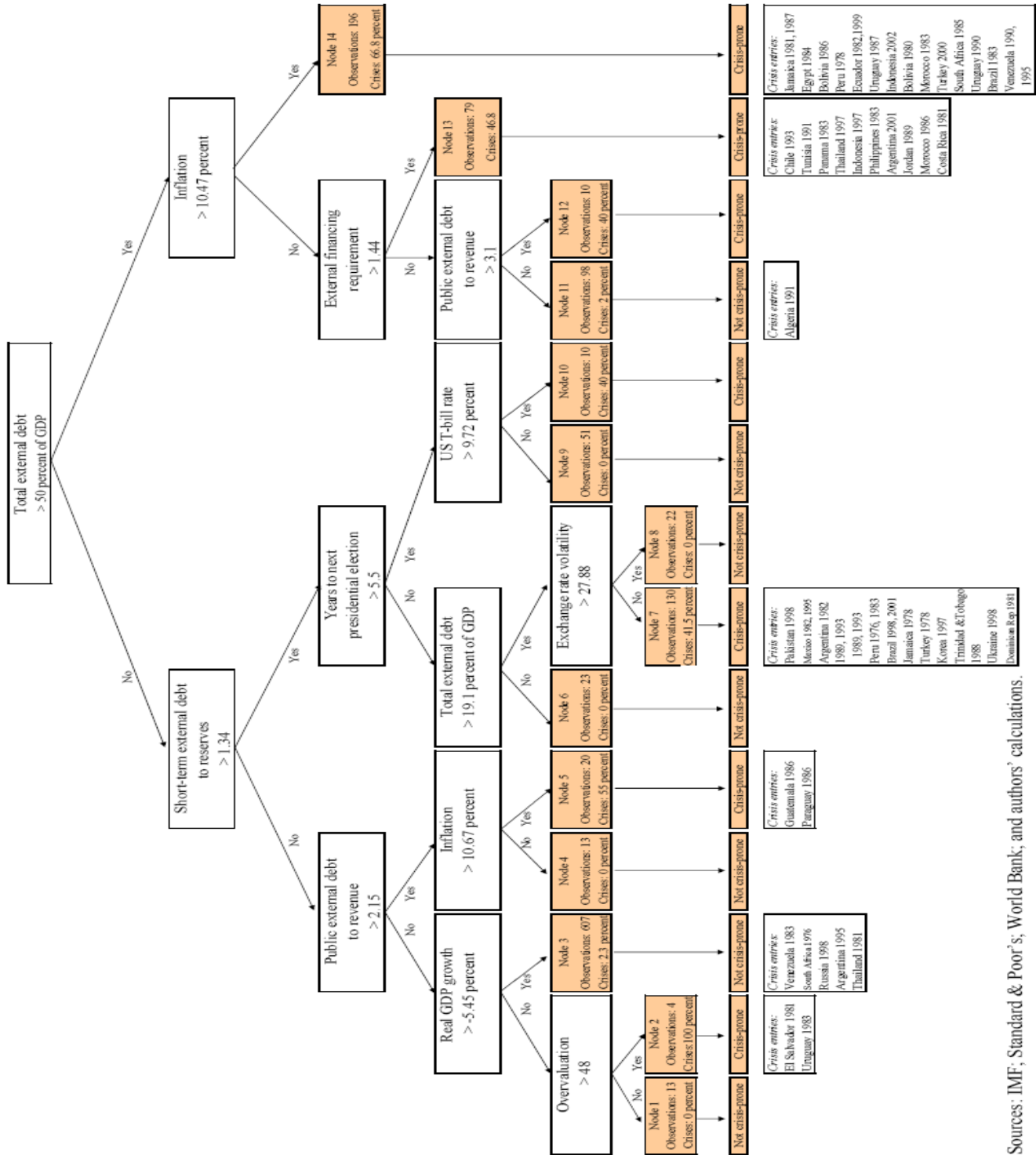
The frequency of type II errors was greater than that of type I errors. In the sample of six countries, with data for 10 years for each country, we notice that the ratio of type I errors to type II errors is 11/ 39. This indicates that 65% of the time, the model indicated that a country was crisis prone when in fact they were not. Of course the region is highly susceptible and is highly indebted, as many of these countries are small, open economies subject to the vagaries of the external environment. So indeed, their fundamentals may be consistently weak, but they are able to service their debt through various borrowing facilities including multinational lending agencies, like the IMF, World Bank and the Inter-American Development Bank (IADB) as well as foreign aid flows into the countries from the larger, wealthy more developed economies.

Conclusion:

We see that looking at the indicators for each of the six countries, the only countries which are not at risk of a debt crisis at the end of 2007 are Trinidad and Tobago and Belize. In the case of Trinidad and Tobago, indebtedness remains relatively low mainly due to the buoyancy of the energy sector and the above trend oil and natural gas prices on the international markets, which have allowed the T&T authorities to improve the country's debt profile. This is reflected in the country's credit rating of 'A'. Belize is also not crisis prone, given its relative economic strength and low inflation as well as an improving debt profile. This resulted from the debt restructuring exercise which did not reduce the stock of the government's debt, but it significantly lengthened its maturity and decreased debt interest payments. The country with the highest level of crisis probability is Jamaica. Given the country's vulnerability to the external economy, and the extremely high level of public debt to GDP ratio, the crisis probability of 66.8% can be theoretically justified.

While Barbados is rated as 'investment grade' by S&P, it still falls under crisis prone country, possibly because of the high level of debt. However, given the high probability of the model to produce type II errors, the results should be analyzed carefully and further work may be required to predict really and truly whether the country is indeed heading for a crisis to ensure that the right mix of policy is adopted. Most of the other Caribbean countries are plagued with high debt levels, and are at high risk to swings in the international financial markets given the high level of debt denominated in foreign currency and this may be one of the reasons why the Caribbean is highly prone to debt crises.

Appendix 1: The Empirical Tree



Sources: IMF; Standard & Poor's; World Bank; and authors' calculations.

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